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A new method for the computation of eigenmodes in dielectric waveguides

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Abstract

A new method for the computation of eigenmodes in Isotropic cylindrical loss-free dielectric waveguides is proposed. Such waveguide is a cylindrical structure with the refractive index n not varied along the generatrix of cylinder. It is assumed that the waveguide is infinitely long and is in unbounded space with the constant index of refraction n∞ > 0. Besides, maxn > n7infin;. Eigenmodes are generator-free electromagnetic waves which satisfy the homogenous Maxwell equations. We consider surface waves. Original problem formulated in unbounded domain is reduced to a linear generalized spectral problem in the circle n containing the domain of the cross-section of the waveguide. To approximate obtained problem Finite Element Method is used. Our method allows computing of waveguides of different cross-sections such as circle, square, rectangle, three-circle, etc.